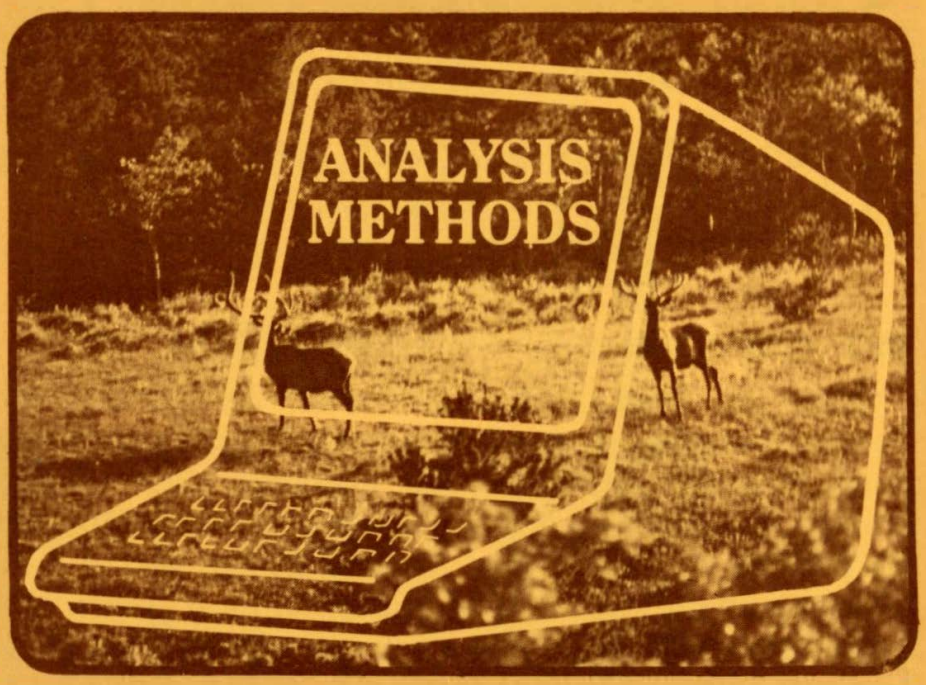
RPA Assessment & RCA Appraisal of

FISH & WILDLIFE RESOURCES

by Thomas W. Hoekstra and David E. Chalk



USDA Forest Service
Rocky Mountain Forest And Range Experiment Station
Fort Collins, Colorado

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Process

RPA (Resources Planning Act) assessments and RCA (Resource Conservation Act) appraisals are mechanisms for monitoring the nation's renewable resource situation. These processes require successive inventories of resource production and use to evaluate:

- the ***accuracy of projections*** of resource availability and use, and
- the ***success of resource management plans*** in meeting quantified objectives.

These analyses for wildlife and fish include:

1 INVENTORIES of current land and water areas, wildlife and fish populations, and production capability of habitats;

2 PROJECTIONS of resource inventories and use, and

3 IMPLICATIONS AND OPPORTUNITIES for improving the current situation through alternative resource management programs.

BUT HOW IS ALL THIS DATA ANALYZED?

Scientists from both the Forest Service and Soil Conservation Service are at work at the USDA Forest Service Rocky Mountain Forest and Range Experiment Station on this problem. Here they are developing and evalutating **ANALYSIS METHODS** and collecting certain data for use in future assessments and appraisals of wildlife and fish. The analysis methods for each step in the process are described in this brochure, with references listed for further reading. For additional information, you may contact (at the Rocky Mountain Station):

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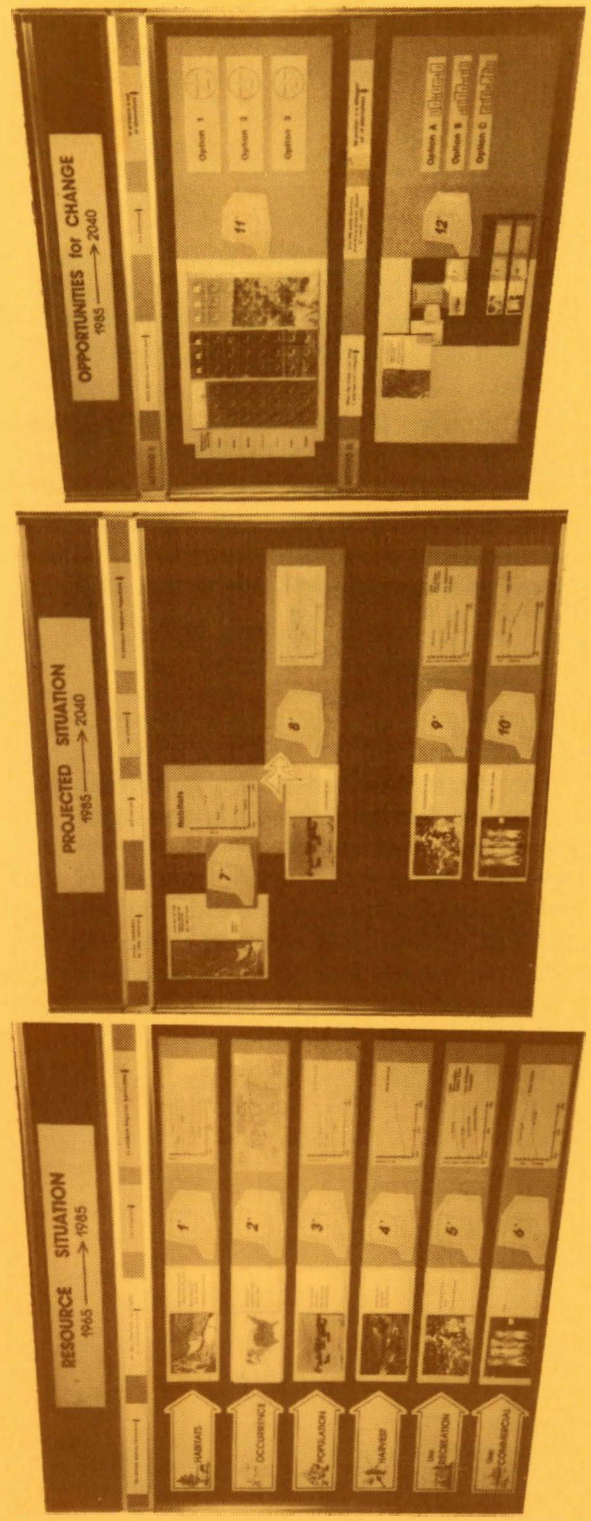
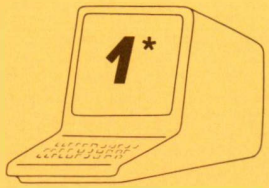




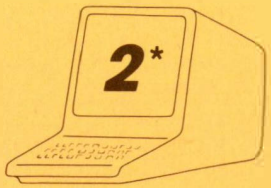
Habitat

The description of the current wildlife and fish habitat situation is specific to a species or group of species. So before we can quantify the habitat, we must first develop an appropriate description of habitat for each species under consideration at a regional reporting level.

Land use, land cover, and vegetation structure descriptors of land area are compiled at the county or wildlife administrative unit level for both terrestrial and semiaquatic vertebrate species.[1] For fish species, information on water quantity, water quality, land use, and land cover is being compiled at the county or USGS cataloging unit level. In addition to these descriptors, data on climate is also collected and summarized by county. All these data are being collected from existing Forest Service and Soil Conservation Service data bases.

Statistical models are then used to correlate wildlife and fish abundance with water, climate, land use, land cover, and vegetation structure.[2,3,4] Other models are also used to determine the potential suitability of the habitat to provide the layers of habitat needed by groups of wildlife species.[5] The discrete classes of actual classes of wildlife and fish abundance, therefore, are related to different levels of habitat quality. The statistical models are used to identify those specific data elements that are most closely associated with the wildlife and fish abundance classes. These data elements are used as a basis for producing regional summaries of current wildlife habitat quantities.

[1]*Chalk et al. (In Press)*
[2]*Capen D. E. Editor 1981*
[3]*Flather and Hoekstra (In Preparation)*
[4]*Kitchings and Klopatek 1981*
[5]*Thomas et al. 1983*



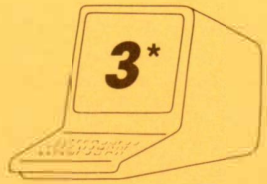
Occurrence

By using map overlay methods, we will compile distributions of individual species by counties (for terrestrial and semiaquatic species) and by cataloging units (for fish). Additional information on the occurrence of terrestrial and semiaquatic species related to vegetation type and structural characteristics will be derived from existing references.[1] Similarly, information on the occurrence of fish species related to water temperature, turbidity, alkalinity, flow, and toxicity levels will be obtained from existing references.

Where occurrence is not known, a measure of the quality and structure of the habitat will be used to estimate the potential number (diversity) of species which could occur within an area.[2]

Finally, the occurrence of vertebrate groups by counties or cataloging units with associated vegetation and water descriptors, are compiled into regions as specified for presentation in the RCA appraisal and RPA Assessment.

[1]*Schweitzer et al. 1978*
[2]*Thomas et al. 1983*

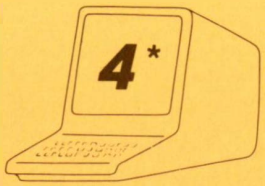


Population

We will compile population levels of individual vertebrate species or indices of abundance on an annual basis. Then display this data as a time series showing historical population size by county or agency administrative unit (for terrestrial and semiaquatic species) or by cataloging unit (for fish).

When sex, age, and mortality information are available for the total population, simulate populations from historical inventories to estimate missing information or to evaluate inventory information on total population size.

Where current population levels are unavailable, estimate them from the current habitat situation by using the statistical models developed in Analysis No. 1.

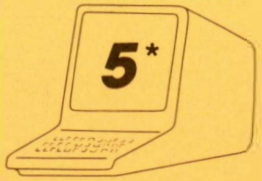


Harvest

We will compile annual harvest levels of game species, and show this data as a time series of historical harvests by county or wildlife administrative unit (for terrestrial and semiaquatic species) or cataloging unit (for fish). Harvest levels can be used when numbers of hunters or fishermen are included with the information on habitat. In cases where sex and age information are available in the harvest data, we will estimate the time series of the likely population supporting the harvest.[1]

[1] *Dasmann and Dasmann 1963*

BIBLIOGRAPHY



Recreation Use

Recreation use of wildlife and fish resources includes activities such as viewing, hunting, photographing, and fishing.

Nationwide data on participation by recreation activity is available in the National Hunting and Fishing Survey conducted at five-year intervals.[1] We will use statistical regression procedures to approximate trends in numbers of users by category of use.[2] National Hunting and Fishing Survey information available at the state level will be used to construct regional summaries. State wildlife and fish agencies survey the numbers of hunters or fishermen, days spent recreating, and success by type of license. Time series data on these variables by state or substate units also can be analyzed in a statistical regression analysis to establish regional trends. Some ownerships, such as National Forests, collect recreation use information, which can be analyzed in a way similar to that of state data and provide historical trends by regions.

[1] *USDI Fish and Wildlife Service 1960 to 1980*
[2] *Wegert 1978*

Commercial Use

Commercial use of wildlife and fish resources includes those situations when harvest results in the direct sale of meat, furs, or other parts of an animal.

Commercial fishing is a major form of this use. Three categories of commercial fishing are recognized in assessments and appraisals:

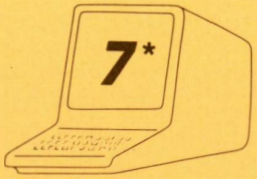
1. anadromous fish,
2. resident freshwater species, and
3. commercial fishing in estuaries where it is affected by land use practices.

Commercial use of wildlife is principally in the form of furs.

In the case of commercial anadromous and resident fish, Department of Commerce and state agency information on annual number of and prices for pounds of species landed are summarized graphically over time. A major source of information on trends includes those special studies which have analyzed the supply and demand for commercial fish.[1]

Information on the use of wildlife for their furs can be obtained from those states where information on numbers of licenses sold and surveys of participants provide annual information. Analysis of such information, together with prices paid for different species of furbearers are graphically summarized by region. Previous special studies, such as those carried out by Deems and Pursley, have provided an important synthesis of furbearer information.[2]

[1] *U.S. Department of Commerce 1973*
[2] *Deems and Pursley 1978*



Habitat Projection

Projections of wildlife and fish habitats provide insight into possible future supplies of wildlife and fish. Such projections will predict the response of these habitats to management activities resulting in changes in land use/land cover patterns, or changes in water quantity and quality.

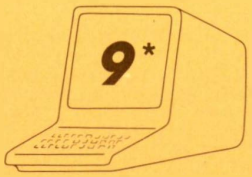
The statistical models constructed to quantify current habitat (Analysis No. 1) will form the basis for prediction of future habitat quantities. Once these models have identified those data elements that describe the habitat for a particular species or group of species, habitat projections can be made based on estimates of change in the land base. Future land use/land cover or water quality are estimated from crop[1] or timber inventory[2] projections or land use area projections.[3] This information then becomes the input data representing a second time period for the statistical habitat models.

Output from the statistical models represents an estimate of the response of these habitats to the perceived change in land use, land cover, or vegetation structure. Linking these resource projection models to the wildlife and fish habitat models requires that they contain variables which are commonly defined.

[1] *U.S. Department of Agriculture, Economic Research Service 1982*
[2] *Tedder et al. 1983*
[3] *Alig and Knight 1983*

Population Projection

Analysis No. 7 then leads directly to the projection of wildlife and fish populations. Actual projection of wildlife and fish abundance is based on the resource (crop, timber, land use area) projection models that feed the analysis of habitat projection. The statistical models developed in Analysis No. 1 can be used to directly estimate abundance levels associated with changed habitat areas. Where population abundance data are not available, harvest estimates will be used as an alternative measure.



Recreation Use Projection

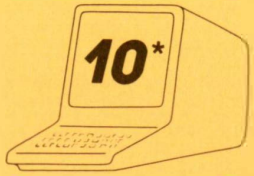
Projection of recreation use can be accomplished in two ways.

First, projections can be made based on the assumption that the current relationships between quantities of wildlife and fish and variables which influence their recreational use will be the same in the future. In this case the result is a projection of past trends with changes resulting primarily from different human population levels.[1]

Second, these projections can be made based on their relationship to a price surrogate such as travel or time cost, the quantity of wildlife and fish resources available for use, and the traditional demand shifters such as human population, income, age, etc.[2]

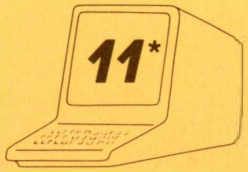
Which analysis will be used depends on the data available. The first analysis requires less data but also provides less information regarding projected use.

[1] *Wegert 1978*
[2] *Hof and Kaiser 1983*



Commercial Use Projection

Projection of commercial use will be based on analyses conducted outside USDA. These analyses are expected to be trend projections based on information about the prices, quantity of resource stocks and traditional demand shifters such as human population, income, age, etc.



Method I
Optimization Analysis

By using a linear programming model, the opportunities for change can be analyzed. Information needed to support such an analysis includes:

- the quantities of different types of land,
- appropriate land management actions,
- resource responses to management actions,
- costs of resource management actions, and
- benefits associated with resources produced.

A linear programming model can then be run to optimize the amount of land that would be managed by various actions to produce a combination of resource outputs based on different objectives. Such objectives include the least cost or maximum present net value in combination with different resource production targets. Both the Soil Conservation Service[1] and the Forest Service[2,3] use and are developing linear programming models for planning.

The use of linear programming models in RPA and RCA requires data on habitats and populations produced as a result of land management actions. In the past such data were generally not available for large areas of the land base. Scientists are now working to compile this information.

[1]*Nicol and Heady 1975*
[2]*Johnson et al. 1980*
[3]*Hof 1983*

Method II
Econometrics

Opportunities for changing the current wildlife and fish resource situation can be estimated by tracking projected changes for other resources, such as timber and agricultural crops. Such changes are projected based on different assumptions about supply and demand changes.

In addition, changes in the amounts of land in different uses can be projected based on policy assumptions about prices of market resources, human population, etc. Opportunities for change in wildlife and fish resources are dependent upon these policy assumptions that affect alternatives for other resources and use of land area. Future quantities of habitat can be estimated from the results of these other resource and area projection models as shown in the analysis of the projected situation (Analysis Nos. 7 and 8).

General References

Hawkes, Clifford L., David E. Chalk, Thomas W. Hoekstra, and Curtis H. Flather. 1983. Prediction of wildlife and fish resources for national assessments and appraisals. USDA Forest Service General Technical Report RM-100, 21 p. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Hoekstra, Thomas W., David E. Chalk, Clifford L. Hawkes, and Stephen A. Miller. (In Press.) Monitoring regional wildlife and fish habitats and populations for national assessments and appraisals. Trans. N. Amer. Wildl. and Natur. Resourc. Conf. 48:000-000.

Hoekstra, Thomas W., Michael P. Farrell, Curtis H. Flather, and Clifford L. Hawkes. (1983.) Wildlife and fish data base for the 1989 national RPA assessment. In Computer uses in fish and wildlife programs: a national workshop. December 5 to 7, 1983. Blacksburg, VA.

Hoekstra, Thomas W., and John G. Hof. (In Preparation.) Technical requirements for national assessments of wildlife and fish. Wildl. Soc. Bull.

Literature Cited

Alig, Ralph J., and Herbert Knight. (1983) Forest acreage model for the U.S. Southeast, pp 242-246. In Proceedings of the Conference on renewable resource inventories for monitoring change and trends. Ed. Bell, J. F. and T. Atterbury, Oregon State University, Corvallis, OR. 737 p.

Capen, David E., Editor. 1981. The use of multivariate statistics in studies of wildlife habitat. USDA Forest Service General Technical Report RM-87, 249 p. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Chalk, David E., Stephen A. Miller, and Thomas W. Hoekstra. (In Press.) Multiresource inventories: integrating wildlife resources. Wildl. Soc. Bull.

Dasmann, W.P., and R.F. Dasmann. 1963. Abundance and scarcity in California deer. California Fish and Game 49:4-15.

Deems, E.F., and D. Pursley. 1978. North American furbearers: their management, research, and harvest status in 1976. International Association of Fish and Wildlife Agencies, University of Maryland Press, College Park. 217 p.

Flather, Curtis H., and Thomas W. Hoekstra. (In Preparation) Use of ecological theory in an evaluation of population-habitat models for national wildlife assessments. Wildl. Soc. Bull.

Hof, John G. 1983. Estimating the effects of multiresource and environmental objectives in modeling timber supply. In Proceedings of the IIASA North American conference on forest sector models. pp. 215-228. Williamsburg, VA. AB Acad. Pub.

Hof, John G., and Fred H. Kaiser. 1983. Projections of future recreation use. U.S. Dept. Agriculture, Forest Service. Res. Bull. WO-2. Washington, D.C. 9 p.

Johnson, K. N., D. B. Jones, and B. M. Kent. 1980. Forest Planning Model (FORPLAN): user guide and operations manual. Systems Application Unit, Land Management Planning, U.S. Dep. Agric., Forest Serv., Fort Collins, CO.

Kitchings, J. T., and J. M. Klopatek. 1981. A regional approach to the prediction of distribution and abundance of animal species. Contract final report to the USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 22 p.

Nicol, Kenneth J., and Earl O. Heady. 1975. A model for regional agriculture analysis of land and water use, agricultural structure, and the environment: a documentation. Misc. Report. Center for Agricultural and Rural Development. Iowa State University, Ames, IA.

Schweitzer, Dennis L., Charles T. Cushwa, and Thomas W. Hoekstra. 1978. The 1979 national assessment of wildlife and fish: a progress report. Trans. N. Amer. Wildl. and Natur. Resour. Conf. 43:266-273

Tedder, P. L., Jonna P. Gourley, Richard N. Lamont. 1983. The timber resource inventory model (TRIM): a timber inventory projection model for national timber supply projections and policy analysis. Contract Report to USDA Forest Service, WO-FRER Staff. 155 p.

Thomas, Carl H., Robert G. Streeter, David E. Chalk, and Bairy D. Sroufe. 1983. An automated SCS RCA national appraisal for wildlife, 1985. In Computer Uses in Fish and Wildlife Programs. A National Workshop. December 5 to 7, 1983. Blacksburg, VA.

U.S. Department of Agriculture, Economic Research Service. 1982. The Economic Research Service's NIRAP system: a brief summary. Mimeo. 7 p.

U.S. Department of Commerce, National Marine Fisheries Service. 1973. Basic economic indicators: salmon, 1947 to 1972. Current Fisheries Statistics No. 6129, p. 33, Washington, D.C.

U.S. Department of Interior, Fish and Wildlife Service. 1960 to 1980. National survey of hunting, fishing, and wildlife associated recreation. Washington, D.C.

Wegert, W. E. 1978. Demand analysis and projection of use for hunting and fishing opportunities. M.S. Thesis. College of Forestry and Natural Resources. Colorado State University, Fort Collins, CO.

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